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Abstract

Purpose – The purpose of this paper is to examine employees' personal performance after mobile customer relationship management (m-CRM) use based on an updated model of information system (IS) success. The authors also investigate whether personal performance of employees varies according to the period of m-CRM use.

Design/methodology/approach – Bootstrapping is employed to analyze data collected from a survey of firms using m-CRM. The survey targeted executives and staff members in departments related to the development and application of m-CRM systems.

Findings – The results indicate that some of the factors had no significant effect on employees' personal performance through employee satisfaction and system use as mediators. Overall, however, the three types of quality had significant effects on employees' personal performance through employee satisfaction and system use.

Practical implications – The study provides a number of strategies that managers or executives might deploy within organizations to improve employees' personal performance through the implementation of m-CRM systems. It is of paramount importance for managers or executives to develop m-CRM systems that provide high-quality information and service including sufficient customer-based analysis, up-to-date customer information, barrier-free design and personalized service.

Originality/value – It is the first study to empirically test the role of m-CRM characteristics in predicting employees' personal performance. This study will not only add contribution to the DeLone and McLean's theory, but also contribute to the IS literature in IS success. The findings will

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also provide useful insights for guiding managers or executives in formulating and executing effective strategies to enhance the level of m-CRM use and employee satisfaction which in turn promote personal performance.

Keywords Employee satisfaction, m-CRM, Personal performance, System use
Paper type Research paper

1. Introduction

In the last few years, customer relationship management (CRM) has been identified as one of the most promising technological innovations in the business domain for having the immense potential to enhance employee's work efficiency and facilitate the interaction with customers (Li and Mao, 2012). After years of development, CRM has drawn increased attention from both industries and research organizations. In the age of mobile communications, innovation and change have been viewed to play a pivotal role in business success, and in this context, the mobile revolution represented by smartphones represents a new paradigm of enterprise management. Because an intrinsic attribute of mobile devices is the dynamic movement, there is increasing demand for mobile customer relationship management (m-CRM) to integrate online and offline CRM because of its characteristics such as mobility and ubiquity (Mirbagheri and Hejazinia, 2010). For firms, m-CRM overcomes existing traditional CRM limitations such as obtaining customer information through face-to-face interactions and wired networks by enabling the ability to easily obtain customer information anytime, anywhere. In addition, employees can benefit from rapid and continuous information updates and engage in real-time marketing. For improved personal performance, the adoption of m-CRM channels through the use of mobile applications has received increasing attention. However, previous studies have mainly focussed on the customer side and generally proposed research models based on the technology acceptance model, ignoring the role of m-CRM characteristics in personal performance (Karjaluoto *et al.*, 2014). To address the limitations in previous m-CRM research, this study adopts Delone and Mclean's (2003) model of information system (IS) success as the theoretical foundation for revealing factors shaping m-CRM personal performance. The study has the following two main objectives: first, by drawing from previous research on potential determinants of m-CRM success, the study investigates whether customer segmentation, customer information integration, system extensibility, system flexibility, immediacy, and personalization influence employee's personal performance via user satisfaction and system use. In addition, previous studies have indicated that a firm's long-term strategy is a crucial factor influencing its CRM success (Vazifehdust and Shahnavazi, 2012). A short-term organizational culture can be a direct obstacle to the promotion of CRM. Therefore, a comparative analysis of customers' personal performance based on the amount of time elapsed since the introduction of m-CRM can contribute to the development of m-CRM (LaValle and Scheld, 2004). In this regard, the study investigates whether personal performance varies according to the period of m-CRM use.

To achieve these two objectives, a literature review was conducted to identify the constructs examined in our research model. Because research on m-CRM is still in a preliminary stage, therefore, an extended range of relevant studies was reviewed, including literature on CRM, IS success. Finally, the DeLone and McLean's (2003) model was employed as the basic theoretical foundation to construct a theoretical framework that focusses on three dimensions: information quality, system quality, and service quality. To test the model, structural equation modeling was employed to analyze data

collected from 217 respondents in South Korean firms which implemented m-CRM systems. The findings provide a theoretical foundation for academics and also practical guidelines for managers or executives in dealing with the successful implementation of m-CRM.

From a theoretical perspective, this is the first study to empirically test the role of m-CRM characteristics in predicting employees' personal performance. This study will not only add contribution to the DeLone and McLean's model, but also contribute to the IS literature in IS success. From a practical perspective, the findings will provide useful insights for guiding managers or executives in formulating and executing effective strategies to enhance the level of m-CRM use and user satisfaction which in turn promote personal performance.

The rest of this paper is organized as follows: Section 2 provides the theoretical foundation for IS success and m-CRM characteristics. Section 3 describes the research model and hypotheses, and Section 4 introduces the research method. Section 5 discusses the empirical analysis, and Section 6 concludes with theoretical and practical implications.

2. Theoretical background

2.1 m-CRM

m-CRM has been defined as "communication, either one-way or interactive, which is related to sales, marketing, and customer service activities conducted through the mobile medium for the purpose of building and maintaining customer relationship between a company and its customer" (Sinisalo *et al.*, 2007; Karjaluoto *et al.*, 2014). m-CRM can overcome existing CRM limitations in obtaining customer information (Schierholz *et al.*, 2007; Josiassen *et al.*, 2014; Khodakarami and Chan, 2014). For example, organizations that adopt m-CRM can collect and use customer information anytime, anywhere through networks connected by the internet. In addition, it is beneficial to establish a real-time CRM strategy by continuously accessing updated information anytime, anywhere (Chae and Kim, 2003). Therefore, m-CRM expands the CRM channel and the boundary of CRM through the effective management of marketing networks (Schierholz *et al.*, 2007; Khodakarami and Chan, 2014). In other words, the drawback of the separation between information collection and marketing channels can be easily solved by using the wireless internet, which provides a direct channel for customer responses. Further, immediate feedback is possible through sending and receiving customer information on a real-time basis. These characteristics of m-CRM can substantially increase satisfaction (Peltier *et al.*, 2012).

Based on previous research, this study defines m-CRM as a CRM activity based on the formation of two-way relationships with customers through real-time customer experience information obtained from knowledge of customers' tendencies, locations, purchase information, and needs based on the use of mobile channels.

2.2 IS success

In the IS literature, a variety of models have been presented to address the use of ISs (Garrido-Moreno and Padilla-Meléndez, 2011; Kim *et al.*, 2012). Some of them have focussed on the notion of IS adoption (e.g. TAM, TAM2, UTAUT, UTAUT2, etc.), while others have focussed on the measurement of IS success or effectiveness (e.g. Delone and Mclean's success model, etc.). Among these, DeLone and McLean (1992) comprehensively reviewed the different IS success measures and proposed a six-factor IS success model

as a taxonomy and framework for measuring the complex-dependent variables in IS research. This model is a framework for conceptualizing and evaluating IS success based on previous theoretical research as well as on empirical studies in the field of the MIS (Delone and McLean, 1992). DeLone and McLean (2003) proposed an updated model by considering changes in the role of ISs and related issues. The key difference between the two models is that because of the expansion of users' computer environments, the role of the IS field has shifted from a simple information provider who develops ISs to a service provider operating ISs. Reflecting this shift, the new model incorporates service quality. In addition, the new model replaces the combination of individual and organizational impacts in the first model with a new variable for net benefits because of the shift in research purposes and situations (Delone and McLean, 2003).

As shown in Figure 1, the new model of IS success suggests that system quality, information quality, and service quality have considerable influence on system use and user satisfaction and thus on individual and organizational performance (Vazifehdust and Shahnavazi, 2012).

We assume that the DeLone and McLean's updated IS success model can be adapted to the system success measurement in the m-CRM context because this model was originally built to ease managing IS activities in organizations by measuring the quality of delivered systems and addressing the central concern of IS success and effectiveness in the workplace (Delone and Mclean, 2003). In addition, Delone and Mclean's model has also been considered applicable for studying IS effectiveness at the individual level (Delone and Mclean, 2003). While Delone and Mclean's model has received much attention among researchers, little research has been conducted to assess the effectiveness of m-CRM systems. There is a need to investigate whether traditional IS success models can be applied to m-CRM context. Hence, this study aims to determine the relationship between m-CRM quality and personal performance in an organizational context based on the framework of the model of Delone and Mclean's IS success, which reveals the relationship between IS quality and net benefits (Garrido-Moreno and Padilla-Meléndez, 2011). Based on the literature review, this study establishes the variables for information quality, system quality, and service quality, which are the core characteristics of m-CRM. In addition, the study provides an empirical analysis of the effects of these three types of quality on personal performance in the m-CRM context.

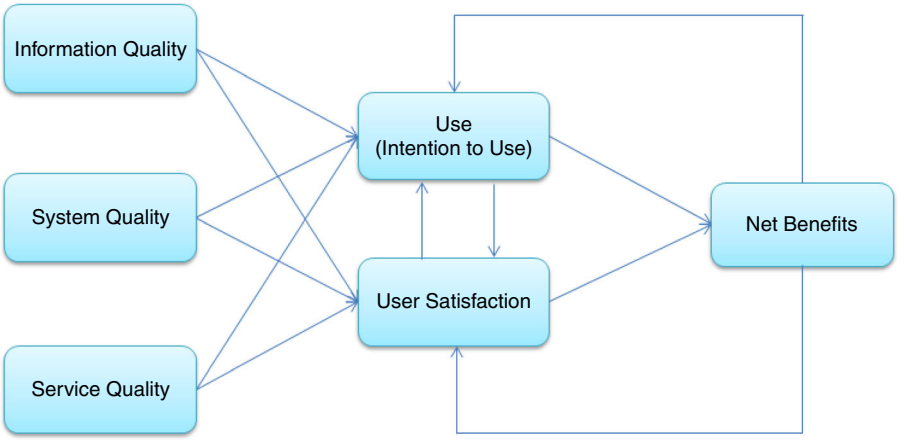

Figure 1.
DeLone and McLean's (2003) model of IS success

2.3 Information quality, system quality, and service quality

IS research began with the advent of computers and has witnessed a substantial transformation since the emergence of IT. Based on physical components in the field of computer science, IS quality has been examined from hardware, software, network, and database perspectives, among others. Many studies have examined quality indicators and measurement items for each area (DeLone and McLean, 2003). The present study sets m-CRM as a type of IS and discusses IS quality from three perspectives, namely information quality, system quality, and service quality (Pitt *et al.*, 1995; DeLone and McLean, 2003).

Information quality refers to the quality of information produced by a system. Many researchers have attempted to devise methods for identifying and measuring information quality (DeLone and McLean, 2003). Information quality is related to the efficiency and satisfaction of employees who use ISs as well as to employers' decision-making quality. Recently, the range of IS users has expanded to external CRM users. In addition, information quality has a direct effect on the financial performance of organizations, and therefore many have argued the increasing importance of information quality (DeLone and McLean, 2003). Accuracy is an obvious factor that can be used to measure information quality, but it depends on the level of information use and its purpose, and various attributes from the employee's perspective (e.g. understandability, reliability, timeliness, and usefulness) can be set as evaluation indicators.

In the model of IS success, in addition to information quality, system quality is proposed to influence IS use and user satisfaction. DeLone and McLean (2003) found that system quality is related to e-business success and included adaptability, availability, reliability, the response time, and system convenience in system quality. Mckinney *et al.* (2002) defined system quality as connectivity, interface ease, navigation efficiency, and system interactivity to examine web services and pointed out that the presence of system errors is an aspect of system quality. According to previous research, system quality means the level of information-processing quality in the mobile environment when using services and/or accessing information through mobile systems such as mobile channels and devices.

The new model of IS success adds service quality to the old one, and this change indicates the significant impact of service quality on IS success. Information quality and system quality can be used to evaluate the performance of the system itself, but service quality is the most important indicator of the overall IS performance. Pitt *et al.* (1995) argued that it is necessary to add service quality to the original model of IS success and analyzed service quality (SERVQUAL). DeLone and McLean (2003) found that service quality, including assurance, empathy, and responsiveness, has considerable influence on e-business performance. Therefore, DeLone and McLean (2004) applied their model of e-business success to Barnes and Noble and ME Electronics and found that both verified that responsiveness, a crucial factor influencing service quality, has considerable influence on user satisfaction.

2.4 m-CRM characteristics

m-CRM has involved into three main forms. The first generation of m-CRM is based on short messaging service (SMS) and multimedia messaging service. However, many serious defects expose in the first generation. One of the most severe problems is time

effectiveness. In addition, the query result is incomplete due to the limit of message length. The second generation of m-CRM adopted technology based on WAP. Mobile-users get access to WAP web pages through browser and achieve information inquiry. This form partly solved the imperfection of the SMS technology. However, the main drawback of the second generation technology is mainly reflected in the poor capability of interaction while accessing to WAP web page, thus placing a big limit on flexibility and convenience of m-CRM. The security of accessing to WAP web page is problematic for business system which sets high requirements on system security. The latest generation of m-CRM integrates several kinds of frontier technologies of mobile communication, information management and computer technology, including 3G mobile technology, smartphone APP, database synchronization, identity authentication. This integration facilitates system security and the capability of interaction. Consequently, the latest form provides managers with a secure and rapid rule of implementing modern mobile technology (Karjaluoto *et al.*, 2014). In this study, we mainly focus on the latest form of m-CRM and attempt to identify context-specific constructs that can better address the unique characteristics of this kind of m-CRM.

m-CRM entails activities based on the mobile internet, not on the original stationary internet (Chae and Kim, 2003). Cunningham and Song (2007) mentioned that the core of m-CRM involves handled devices. In addition, m-CRM has the following characteristics: first, the ubiquity of m-CRM that supports real-time information searches and communication regardless of the employee's location reflect the most salient advantage of mobile devices (Tojib and Tsarenko, 2012). Unlike in the case of the movement-restricted online environment based on PCs, the mobile environment allows individuals to exchange mobile transactions anytime, anywhere. Therefore, employees can consume the service by accessing wireless internet networks without any time and location constraints (Garrido-Moreno and Padilla-Meléndez, 2011). The mobile environment can build ubiquitous relationships that make it possible to maintain close interactions with customers anytime, anywhere (Garrido-Moreno and Padilla-Meléndez, 2011; Li and Mao, 2012).

Another characteristic of the mobile environment is situational dependency, through which m-CRM can provide optimal information and services by synthetically considering information on customers, including their location, personal identification, personal background, individual preference, and purchase history as well as other types of information extracted from the CRM database (Cooper *et al.*, 2000; Li and Mao, 2012).

Turban *et al.* (2004) proposed mobility and accessibility as the most important characteristics of mobile computing and business and suggested that mobility enables employees to access systems through wireless networks and devices to execute real-time business as well as to search for and process information. In addition, they pointed out that the access problem of mobile users can restrict certain users at times and thus that it is important to improve the accessibility of mobile services.

Sinisalo *et al.* (2007) summarized the characteristics of m-CRM, including flexible communication, required authorization, cost efficiency, traceability, personalization, familiarity, convenience, interactivity, and lean communication, among others.

Verma and Verma (2013) claimed that m-CRM enables personalized and interactive communication with customers, thereby improving customers' intelligence by making employees easier to gather data on each customer. This permits employees to understand customer needs better and develop suitable responses as well as to improve interactions with customers by retaining a record of their inquiries, transactions, complaints, and problems solved.

3. Research model and hypotheses

3.1 Research model

As shown in Figure 2, this study formulates the research model based on DeLone and McLean's (2003) model of IS success. In the context of m-CRM, the study explores the effects of the core quality characteristics of m-CRM on personal performance through the mediating effects of user satisfaction and system use. In our research model, we also controlled for the effects of organization type, number of employees, and sales volume on personal performance. Since service was the largest industry in our sample, we controlled for organization type by using a dummy variable (service vs non-service firms). Sales volume and number of employees were captured as items in our survey questionnaire.

3.2 Research hypotheses

To empirically analyze the variables in the proposed research model, this study establishes various hypotheses about the relationships between the major variables proposed in previous research.

3.2.1 Information quality. As indicated in DeLone and McLean (2003), information quality is closely related to attributes of information, including accuracy, details, and relations. In addition, information quality can improve user satisfaction. It is important to enhance information accuracy, details, and relationships for a high level of information quality. Many CRM studies have explored efficient ways to improve information quality.

Previous research has suggested a need to construct a customer database for firms in the context of m-CRM to efficiently acquire customer information (Sinisalo *et al.*, 2007). In addition, customer segmentation is helpful in the customization of products and services by the justification of resource allocation (Aeron *et al.*, 2012). Previous studies have shown that customer segmentation can substantially improve staff's satisfaction (Garver, 2009). The segmentation of customer groups has been suggested as an m-CRM strategy (Schierholz *et al.*, 2007).

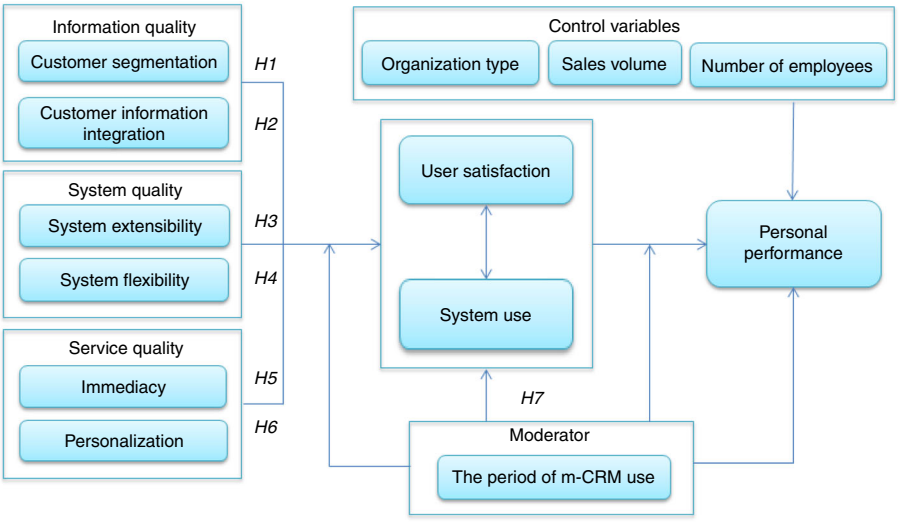

Figure 2.
Research model

Some major characteristics of enterprise CRM tools, including customer data integration, have been verified to play crucial roles in information integration. One intangible benefit of m-CRM is increased satisfaction in employee sides (Chen and Chen, 2004). Information integration has been found to be useful for conducting customer analyses to obtain high work efficiency (Norman, 2012) and can provide a comprehensive understanding of customer data, thereby adding value to employee performance (Schloetzer, 2012), particularly under uncertain environments (Wei *et al.*, 2012). Based on the literature review, information quality (specifically in the context of m-CRM), customer segmentation, and customer information integration may influence user satisfaction and system use.

In addition, previous studies have pointed out that the level of system use can have considerable influence on user satisfaction as well as outcomes of mobile commerce (DeLone and McLean, 2003; Martín *et al.*, 2012). The results of an empirical analysis of ERP indicate a significant positive relationship between user satisfaction and user performance. In many other areas, user satisfaction has been verified to be critical for final performance (Delone and Mclean, 2003; Steven *et al.*, 2012). Based on this line of reasoning, we propose the following hypotheses:

H1. The effect of customer segmentation on personal performance is mediated by user satisfaction and system use.

H2. The effect of customer information integration on personal performance is mediated by user satisfaction and system use.

3.2.2 System quality. DeLone and McLean (2003) showed a positive relationship between system quality and user satisfaction. System quality refers to convenience, flexibility, reliability, accessibility, and suitability, among others. Therefore, as part of system quality, both system extensibility and flexibility may be positively related to user satisfaction and system use.

m-CRM data and systems are more complex and changeable because there are more customization requirements for CRM (Kabak and Dogac, 2010). In addition, Sinisalo *et al.* (2007) pointed that because some mobile devices cannot be accessed through wireless networks, the system needs to be extended under such situations. However, few studies have discussed the extensibility of m-CRM. On the other hand, in other contexts such as conferencing systems and modify-on-access file systems, the significant effect of extensibility has been verified. Overcoming some challenges in the extensibility of systems can improve systems, particularly in complex situations (Li and Mao, 2012). Other advantages of improving system extensibility include an increase in the system speed, which is crucial for real-time services.

For large firms, m-CRM systems may be built separately by affiliate firms, and therefore the flexibility of m-CRM has to be improved to use m-CRM systems (Schierholz *et al.*, 2007). In addition, ISs need to be flexible to fit various types of businesses and technological innovations. Previous studies have highlighted a positive relationship between IS flexibility and the user's perspective (Ramaraj, 2010).

In addition, as noted earlier, previous empirical studies have indicated that system use and user satisfaction directly affects final performance (Delone and Mclean, 2003; Ramaraj, 2010). To this point, we assume that system extensibility and flexibility influences personal performance indirectly through system use and user satisfaction. Based on this rationale, the following hypotheses are suggested:

H3. The effect of system extensibility on personal performance is mediated by user satisfaction and system use.

H4. The effect of system flexibility on personal performance is mediated by user satisfaction and system use.

3.2.3 Service quality. One of the most important difference between the original model of IS success and the updated one is the addition of service quality. DeLone and McLean (2003) found that IS service quality can improve user satisfaction and use in the e-commerce context. If CRM service efforts are compatible with employees' expectations, such implementation is expected to increase their satisfaction (Kim *et al.*, 2012). In the telecommunications industry, previous research has found that, along with technology quality, service quality should also be emphasized for user satisfaction and system use (Lalitha and Prasad, 2012).

For factors influencing service quality, a report on mobile commerce by Dulacher Research indicated timeliness as a key success factor in m-commerce and mentioned that mobility enables the transmission and use of time-sensitive information because the value is inherent in its immediate delivery and a delayed information transmission can incur a substantial opportunity cost. Therefore, service immediacy can improve user satisfaction. Unlike the stationary internet, the mobile internet provides the user with instant connections to the internet anywhere, anytime. In addition, the mobile internet is portable, and its processing time is always less (Chae and Kim, 2003). In the context of financial service use through mobile phones, immediacy has been found to be an important factor influencing user satisfaction. Other studies have included the environment of social media and financial trading.

On the other hand, from the user's perspective, wireless internet devices are usually more personal and individual than stationary ones (Chae and Kim, 2003). For example, in location-based services supplied by mobile devices, personalization, and customization can substantially increase their value from both web use and user satisfaction (Kim and Lee, 2009; Shin *et al.*, 2011).

The reason that ISs are implemented is to provide some type of benefit to users. For an m-CRM system, the satisfaction that employees have with it should value the system more highly and perceive a stronger benefit from using it. Thus, we assumed that immediacy and personalization increase user satisfaction and system use, which, in turn, increase personal performance of employees. In this regard, the following hypotheses are proposed:

H5. The effect of immediacy on personal performance is mediated by user satisfaction and system use.

H6. The effect of personalization on personal performance is mediated by user satisfaction and system use.

3.2.4 The moderating effect of the period of m-CRM use, organization types and sales volume. At the organizational level, CRM adoption is not only the simple acceptance of a technology but also an important change in the organizational culture that causes the focus to shift from a product-oriented view to a customer-oriented one. Then a long period of organization culture establishment is necessary for this change (Smith, 2006). In addition, previous studies have indicated that this long-term strategy is a crucial factor influencing CRM success (Vazifehdust and Shahnavazi, 2012). At least two to

three years of operation after the establishment of CRM are required before it stabilizes. A short-term organizational culture can be a direct obstacle to the promotion of CRM (LaValle and Scheld, 2004). At the individual level, theory suggests that behavior is likely to be affected by cognition, which includes individuals' beliefs, attitude, and knowledge about their environment. According to Bhattacherjee and Premkumar (2004), cognitions are generally more easily changed than behaviors, especially under circumstances where users lack complete will of their behavior. Over time, user cognitions reach a steady-state balance, as they become more realistic and entrenched in observed behaviors. Applying this to our study, in the beginning of m-CRM implementation, employees do not have complete volition over their behavior, but in the post-implementation phase, the level of m-CRM usage is mainly dependent on them. Thus, the intensity of the interrelations of the variables which make up our research model may change over time because the employee accumulates an experience which influences the perception of each variable and its influence on another one. Therefore, a comparative analysis of employees' personal performance based on the amount of time elapsed since the introduction of m-CRM can contribute to the development of m-CRM. In this regard, the following hypotheses are proposed:

H7. The period of m-CRM use positively moderates the relationships among information quality, system quality, service quality, and personal performance.

4. Research methods

4.1 Operational definitions and measures

To measure the variables, the questionnaire items were modified to fit this study based on verified constructs from previous research. As shown in Table I, the measurement items were developed based on previous research, and their operational definitions were determined in terms of information quality, system quality, and service quality as well as user satisfaction, system use, and personal performance.

4.2 Questionnaire and data collection

Based on previous mobile- and CRM-related research, a questionnaire composed of items for the constructs in the research model was developed. Various items from previous research were modified and applied to this study to increase their reliability and validity, and they were measured using a five-point Likert-type scale.

A pilot survey and individual interviews were conducted over a two-week period (July 1 to 15, 2013) to modify or delete those items that were too difficult to understand or confusing. For this, experts above the level of the section chief with some m-CRM experience were employed.

The questionnaire focussed mainly on the respondent's general background, m-CRM quality, m-CRM effects, and their personal performance. The demographic characteristics included the type of business, the number of employees, turnover, the amount of m-CRM investment, the period of m-CRM use, the education level, and the position. Here m-CRM quality, m-CRM effects, and personal performance were measured using a five-point Likert-type scale.

South Korea was selected as the site of this empirical analysis because the wireless infrastructure required for m-CRM development was already in place. According to a *Korea IT Times* report, South Korea ranked first in the penetration ratio for the high-speed wireless internet among OECD countries for three consecutive years (2011-2013). Such favorable conditions have provided a solid foundation for m-CRM

Variables	Operational definitions	Items	References
Information quality			
Customer segmentation	The segmentation of customers based on database and value analyses	The extent to which customer databases are analyzed The extent to which customer segmentation is based on the analysis of customer value The extent to which the model is constructed based on a customer analysis system (DW, data mining, OLAP) The extent to which customers are analyzed and profiled for discovering potential customers	Sinisalo *et al.* (2007), Schierholz *et al.* (2007)
Customer information integration	The integration of customer data and information	The extent to which integrated management is employed for customer data from related sectors The extent to which integrated management is employed for customer contact files The extent to which customer data standards are established The extent to which customer data are updated and managed on a real-time basis	Chen and Chen (2004), Norman (2012), Schloetzer (2012)
System quality			
System extensibility	The level of m-CRM system extensibility	The extent to which system modules can be extended The extent to which databases can be extended The extent to which networks can be extended The extent to which systems can be updated and extended	Sinisalo *et al.* (2007), Schierholz *et al.* (2007)
System flexibility	The level of accessibility to customer and employee information and the level of their integration/exchange with other channels	The extent to which information on customers and employees can be accessed The extent to which the system can be integrated with other CRM channels The extent to which the system can be exchanged between m-CRM systems The extent to which m-CRM and other CRM channels can be organically integrated	Chen and Chen (2004), Ramaraj (2010)
Service quality			
Immediacy	The acquisition of real-time information by using m-CRM anywhere, anytime	The extent to which information searches can be done by employees on a real-time basis	Dulacher Research, Chae and Kim (2003)

Table I.
Operational definitions and items

(*continued*)

Variables	Operational definitions	Items	References
		The extent to which information can be accessed by employees anytime, anywhere The extent to which necessary information can be acquired by employees anytime, anywhere The extent to which m-CRM is used based on mobile devices anytime, anywhere	
Personalization	The level of suitable personalized service for employees	The extent to which suitable services are provided to employees The extent to which special employees are provided with services in a responsive manner The extent to which useful information is provided to employees The extent to which services are provided based on the latest employee information	Shin *et al.* (2011), Kim and Lee (2009), Li and Mao (2012)
User satisfaction	The level of employee satisfaction based on m-CRM	The level of m-CRM system satisfaction The level of m-CRM system excellence The level of m-CRM use The extent to which m-CRM is recommended to others	Gustafsson *et al.* (2005), Mithas *et al.* (2005), Feinberg and Kadam (2002)
System use	The level of m-CRM use for various functions	The extent to which m-CRM is frequently used for various functions The extent to which the m-CRM system is accessed The extent to which m-CRM is used in own work The extent to which m-CRM is used voluntarily	Kim and Narasimhan (2002), Hung *et al.* (2010)
Personal performance	Employees' perception of tangible and intangible personal performance based on m-CRM use	The extent to which the processing rate improves for own jobs The extent to which job-processing accuracy improves The extent to which the quality of own decision making improves The extent to which the efficiency of the processing method improves for own jobs The extent to which own job performance improves	Chen and Chen (2004), Eid (2007), Ku (2010), Martín *et al.* (2012), Steven *et al.* (2012)

Table I.

implementation in South Korea. This study focusses on the m-CRM performance of South Korean firms. For this, empirical samples were collected through a survey of firms using m-CRM. The survey targeted executives and staff members in departments related to the development and application of m-CRM systems. The survey was conducted over a three-month period from July 18 to October 16, 2013.

A total of 1,800 questionnaires were distributed by e-mail, fax, and/or direct visits to firms such as SK Telecom, KT, and LG U+ as well as to those making use of m-CRM and registered with the Korea Chamber of Commerce and Industry (www.korcham.net) and the Korea Contact Center Association (www.contact-center.or.kr).

For the e-mail survey, the purpose of the study and survey details were explained, and the questionnaire was attached. For direct visits, face-to-face interviews were conducted with departments related to m-CRM and people who were in charge of using m-CRM. To maximize the response rate, reminder e-mail messages were sent every two weeks after the questionnaire was sent by e-mail. One marked questionnaire was collected for each firm through consultation with relevant departments. A total of 263 responses (a 14.6 percent collection rate) were collected, and a total of 217 responses (an 82.5 percent available rate) were used for the final empirical analysis after 46 were excluded for invalid responses or missing data. In addition, the e-mail survey was explained and described in detail in terms of research objects and survey content. However, m-CRM is a new research topic, and therefore the low feedback may be explained by people's lack of m-CRM interest and understanding.

5. Empirical analysis

5.1 Demographic characteristics

As shown in Table II, 35 percent of the respondents were from the service sector, and those from banking/insurance and telecommunications also accounted for large portions of the responses (18.9 and 18 percent, respectively). Medium-sized and large firms accounted for a majority of the respondents, and 54.4 percent invested more than 30,000 US dollars in m-CRM. Noteworthy is that 10.1 percent invested more than one million US dollars in m-CRM. Many firms engaged in m-CRM for more than three years (26.7 percent), and 27.6 percent showed high profitability (more than 500 million US dollars). Most employees responsible for m-CRM had a college degree (77.4 percent) and were section chiefs (32.3 percent). The results for the distribution of the respondents provide confidence in terms of the quality of data collected from high-level representatives.

Because m-CRM is a CRM tool based on mobile IT, information and communications firms as well as industries that depend on robust mobile infrastructure systems, such as service providers and financial services and insurance firms, had much higher response rates in the survey. In addition, more feedback was received from assistant managers, department managers, and general managers because of the direct relationship between m-CRM and their operations.

5.2 Reliability and validity analysis

Nunnally (1978) proposed 0.70 as the recommended threshold for Cronbach's α. An item for a construct not consistent with other items is dropped to increase construct reliability. In this study, some items were dropped (Table III), and as a result, Cronbach's α for all the variables with multiple items ranged from 0.877 to 0.926, exceeding the acceptable threshold of 0.70 and suggesting sufficient reliability.

Category	Freq.	Ratio (%)	Category	Freq.	Ratio (%)
Types			*m-CRM investment (in US dollars)*		
Manufacturing	21	9.7	< 30,000	99	45.6
Finance/insurance	41	18.9	30-59,000	33	15.2
Information technology	39	18.0	60-99,000	23	10.6
Trade/distribution	15	6.9	100-499,000	26	12.0
Medical	17	7.8	500-999,000	14	6.5
Service	76	35.0	Over 1 million	22	10.1
Other	8	3.7	*Period of m-CRM use*		
Number of employees			< 6 months	25	11.5
Fewer than 100	17	7.8	< 1 year	30	13.8
100-299	24	11.1	< 1.5 years	9	4.1
300-499	38	17.5	< 2 years	45	20.7
500-999	39	18.0	< 3 years	50	23.0
1,000-2,999	34	15.7	More than 3 years	58	26.7
3,000-4,999	32	14.7	*Education*		
More than 5,000	33	15.2	Less than high school	9	4.1
Sales (in US dollars)			College degree	168	77.4
< 1 million	16	7.4	Graduate school	6	2.8
1-5 million	11	5.1	Graduate degree	34	15.7
5-10 million	22	10.1	*Position*		
10-50 million	40	18.4	Staff	18	8.3
50-100 million	28	12.9	Assistant Manager	35	16.1
100-500 million	40	18.4	Section chief	70	32.3
More than 500 million	60	27.6	Manager	42	19.4
			General Manager	23	10.6
			Executive (Director)	29	13.4

Table II. Demographic characteristics

Variable	Item no.	Removed variable	Cronbach's α
Customer segmentation	4	Segmentation 4	0.881
Customer information integration	4	Integration 3	0.926
System extensibility	4	Extensibility 4	0.922
System flexibility	4	Flexibility 1	0.904
Immediacy	4	–	0.923
Personalization	4	Personalization 2	0.921
User satisfaction	4	Satisfaction 1	0.877
System use	4	Use 4	0.923
Personal performance	5	Performance 3	0.885

Table III. Reliability test

To examine validity, a confirmatory factor analysis was conducted for the measurement variables. Here various fit indices, including the GFI, the AGFI, the NFI, the CFI, the TLI, the RMR, and the RMSEA, were used to evaluate the goodness of fit of the model. In general, when the standardized regression weight exceeds 0.5 for each factor, there is sufficient construct validity (Anderson and Gerbing, 1988). The standard average variance extracted (AVE) is suggested to be greater than 0.5, and reliability, to be over 0.7 (Hair *et al.*, 1998; Fornell and Larcker, 1981). The results

provide evidence that all the constructs were homogeneous, suggesting sufficient convergent validity. Table IV shows the results of an additional confirmatory factor analysis. All of the factor loadings for the items exceed the recommended level and are significant at $p < 0.001$, no items have cross-loadings above 0.4.

Discriminant validity was assessed by comparing the square root of the AVE with the correlation coefficient between constructs. There is sufficient discriminant validity when the square root of the AVE exceeds this correlation coefficient (Fornell and Larcker, 1981). As shown in Table V, the square root of the AVE for each construct exceeded the correlation coefficient for other constructs, suggesting sufficient discriminant validity between the constructs.

5.3 Evaluation of the model and hypotheses

5.3.1 Model fit. A path analysis using AMOS 16.0 was conducted to test the model fit and hypotheses. The fit was evaluated using various fit indices, including as the χ^2 ratio, the GFI, the AGFI, the NFI, the CFI, the TLI, the RMR, and the RMSEA. The χ^2 ratio (2.094) was less than 3.0, and although the GFI (0.889) and the AGFI (0.868) were marginal, the results generally indicate that the proposed model

Variable	Items	Factor weights	Standardized weights	Error	*t*-value	SMC	Construct reliability	AVE
Customer segmentation	Segm1	1.000	0.862	0.194	–	0.743	0.908	0.714
	Segm2	0.952	0.863	0.175	15.688	0.744		
	Segm3	0.981	0.809	0.284	14.302	0.655		
Customer information integration	Inte1	1.000	0.899	0.146	–	0.809	0.942	0.813
	Inte2	1.067	0.939	0.094	21.751	0.883		
	Inte4	1.009	0.866	0.209	18.463	0.751		
System extensibility	Exte1	1.000	0.875	0.209	–	0.766	0.933	0.802
	Exte2	1.091	0.942	0.104	19.699	0.887		
	Exte3	0.948	0.867	0.203	17.426	0.753		
System flexibility	Flex2	1.000	0.841	0.228	–	0.707	0.922	0.872
	Flex3	1.072	0.888	0.169	16.072	0.789		
	Flex4	1.098	0.886	0.181	16.035	0.786		
Immediacy	Imme1	1.000	0.855	0.224	–	0.731	0.931	0.756
	Imme2	1.190	0.930	0.134	18.995	0.866		
	Imme3	1.075	0.872	0.221	16.927	0.760		
	Imme4	1.012	0.817	0.310	15.114	0.667		
Personalization	Pers1	1.000	0.845	0.202	–	0.714	0.946	0.893
	Pers3	1.061	0.916	0.108	17.793	0.840		
	Pers4	1.036	0.918	0.101	17.841	0.843		
User satisfaction	Sati2	1.000	0.800	0.248	–	0.639	0.908	0.840
	Sati3	1.109	0.844	0.218	13.857	0.712		
	Sati4	1.167	0.876	0.181	14.135	0.767		
System use	Infl1	1.000	0.851	0.188	–	0.725	0.945	0.896
	Infl2	1.160	0.964	0.051	20.059	0.929		
	Infl3	1.078	0.874	0.178	17.126	0.763		
Personal performance	Perf1	1.000	0.812	0.223	–	0.659	0.927	0.812
	Perf2	0.884	0.776	0.223	12.492	0.602		
	Perf4	0.972	0.806	0.220	13.129	0.649		
	Perf5	1.007	0.854	0.163	14.126	0.729		

Table IV.
Validity test

Scale	1	2	3	4	5	6	7	8	9
1. Customer segmentation	*0.845*								
2. Customer information integration	0.637	*0.902*							
3. System extensibility	0.400	0.406	*0.895*						
4. System flexibility	0.504	0.430	0.493	*0.934*					
5. Immediacy	0.690	0.563	0.363	0.475	0.869				
6. Personalization	0.591	0.517	0.289	0.417	0.609	*0.945*			
7. User satisfaction	0.647	0.514	0.344	0.578	0.641	0.572	*0.917*		
8. System use	0.700	0.685	0.350	0.437	0.649	0.597	0.549	*0.947*	
9. Personal performance	0.612	0.420	0.368	0.498	0.596	0.549	0.676	0.598	*0.901*

Note: Numbers along the diagonal indicate the square root of the AVE

Table V.
Discriminant validity

provided a satisfactory fit to the data (NFI = 0.931, CFI = 0.984, TLI = 0.983, RMR = 0.31, RMSEA = 0.32), suggesting its appropriateness for hypothesis testing (Hair *et al.*, 1998).

5.3.2 Common method bias test. We conducted two tests to assess the potential common method bias of our self-reported data. First, we performed a Harman's single-factor test by loading all of the items in this study into an exploratory factor analysis (Podsakoff *et al.*, 2003). The results indicate that the largest variance explained by an individual construct is 11.2 percent. None of the constructs can account for more than percent of the covariance. Second, we added a general method factor in the model and compared with the original measurement model to further examine the common method bias. The general method factor included all the principal variables' indicators and calculated each indicator's variance substantively explained by the principal variables and by the method. The results of statistical analyses indicate that the principal variables loading are all significant, but the general method factor loadings are all not significant. The results of both tests show that common method variance is not a problem in our research.

5.3.3 Structural model. In order to find the best model, we assessed three alternative models. First, a partially mediated model (Model 1) with two mediators (system use and user satisfaction) and six direct paths from customer segmentation, customer information integration, system extensibility, system flexibility, immediacy and personalization to personal performance revealed a good fit to the data. However, the path coefficients from customer segmentation ($\beta = 0.021$, $t = 0.065$, $p > 0.05$), customer information integration ($\beta = 0.104$, $t = 0.521$, $p > 0.05$), system extensibility ($\beta = 0.014$, $t = 0.153$, $p > 0.05$), system flexibility ($\beta = 0.074$, $t = 1.057$, $p > 0.05$), immediacy ($\beta = 0.041$, $t = 1.363$, $p > 0.05$) and personalization ($\beta = 0.062$, $t = 1.078$, $p > 0.05$) to personal performance were not significant. Thus, a fully mediated model (Model 2) was tested subsequently with these six paths constrained to zero, which showed a good fit to the data: $\chi^2(698) = 1{,}481.85$, RMSEA = 0.033, NFI = 0.924, CFI = 0.984, TLI = 0.982, RMR = 0.032. The test result suggested that Model 2 presents better fit for the data ($\Delta\chi^2(6) = 147.21$, $p < 0.05$).

In order to find the best model, two paths (user satisfaction → system use, system use → user satisfaction) were added to the fully mediated model (Model 3) and the results showed a good fit to the data. When Models 2 and 3 were compared, the significant χ^2 difference ($\Delta\chi^2(1) = 22.64$, $p < 0.05$) indicated that this additional path

significantly contributed to the model. The results suggested that Model 3 is better than Model 2. Taken together, Model 3 was selected as the best model. Table VI presents the results for the three alternative models.

5.3.4 Testing mediating effects and control effects. We tested a multiple mediation model by using bootstrapping approach, which is suggested by Preacher and Hayes (2008). This method allows testing for more than one mediator simultaneously. Several recent papers provide conceptual and empirical evidence for the superiority of this test over Baron and Kenny's (1986) widely used procedure and highlight that a significant indirect effect is the only requirement for mediation (e.g. Preacher and Hayes, 2008). Our study used Amos 16.0 to bootstrap the indirect effects of customer segmentation, customer information integration, system extensibility, system flexibility, immediacy and personalization on personal performance. The bootstrap estimates were based on 5,000 bootstrap samples. When an interval for a mediating effect contains no zeros, then the indirect effect is significant with a 95 percent confidence level (Preacher and Hayes, 2008).

Table VII displays the indirect effects and their associated 95 percent confidence intervals. As shown in the table, the indirect effects of customer segmentation, customer information integration, system flexibility, immediacy, and personalization on personal performance via user satisfaction and system use are positive and significant, with 95 percent confidence interval excluding zero, providing supports for *H1*, *H2*, *H4*, *H5*, and *H6*. However, the indirect effect of system extensibility on personal performance via user satisfaction and system use is not significant, providing no support for *H3*. These findings emphasize the importance of user satisfaction and system use since they fully mediate the positive effects of customer segmentation, customer information integration, system flexibility, immediacy and personalization on personal performance.

In addition, the control effects were mostly non-significant ($\beta_{type} = 0.031$, $t = 0.473$, $p = 0.79$; $\beta_{number} = 0.064$, $t = 0.732$, $p = 0.58$), with the exception of that of sales volume on personal performance ($\beta_{sales} = 0.142$, $t = 1.972$, $p < 0.01$).

5.3.5 Moderating effects of the period of m-CRM use. CRM requires a change in one's focus from a product-oriented view to a customer-oriented one. Therefore, it is necessary to formulate a sustainable customer-oriented organizational culture (Smith, 2006). In this study, the moderating effects the period of m-CRM use on the relationships between m-CRM quality and employees' personal performance were analyzed. As shown in Table VIII, firms were divided into two groups: one group with more than 2.11 years of m-CRM operation ($n = 113$) and the other with

Table VI. Fit indices among three alternative models

Items	Model 1	Model 2	Model 3
χ^2	1,629.06	1,481.85	1,459.21
df	704	698	697
GFI	0.873	0.886	0.889
AGFI	0.854	0.857	0.868
NFI	0.915	0.924	0.931
CFI	0.981	0.984	0.984
TLI	0.979	0.982	0.983
RMR	0.034	0.032	0.031
RMSEA	0.036	0.033	0.032

Table VII.
Bootstrap results for indirect effects

		Whole sample			Group by the period of m-CRM use: Shorter ($n = 104$)			Longer ($n = 113$)		
		B^a	95% CI[b]		B^a	95% CI[b]		B^a	95% CI[b]	
Influence relation	Path		Lower	Upper		Lower	Upper		Lower	Upper
Indirect	CS→PP	0.28*	0.041	0.576	0.26*	0.037	0.564	0.29*	0.049	0.585
Indirect	CII→PP	0.16**	0.025	0.357	0.13**	0.021	0.332	0.18**	0.061	0.408
Indirect	SE→PP	−0.02	−0.184	0.231	−0.10*	−0.195	0.227	0.01	−0.124	0.262
Indirect	SF→PP	0.18**	0.043	0.487	0.15**	0.024	0.468	0.19**	0.056	0.498
Indirect	IM→PP	0.24**	0.032	0.549	0.22**	0.029	0.517	0.27*	0.011	0.531
Indirect	PE→PP	0.18*	0.027	0.364	0.14*	0.016	0.343	0.20**	0.009	0.347

Notes: [a]Denotes path coefficients; [b]denotes 95 percent confidence interval; confidence intervals are bias corrected and accelerated. **,* Significance at $p < 0.01$ and $p < 0.05$ levels, respectively

less ($n = 104$). Here this figure was obtained by calculating the mean score of period of m-CRM use. We set it as the point to split the groups.

H7 was partially supported. As shown in Table VII, the period of m-CRM use was found to positively moderate most indirect links between m-CRM quality and personal performance, except for the relationship between system extensibility and personal performance, a possible explanation for this result is that respondents with longer m-CRM use period have more than two years of m-CRM experience and should be fully acquainted with m-CRM use, thus, satisfaction and personal performance is not easily influenced by further repeated visits and use.

6. Conclusions and implications

6.1 Summary

Along with advances in ICT and the rapid diffusion of smartphones, customers' needs have become diversified, and competition between firms has become increasingly severe. Therefore firms are paying closer attention to CRM. In particular, in mobile environments, m-CRM is crucial not only for firms' growth but also for the significant improvement of employees' performance. For this reason, based on DeLone and McLean's (2003) model of IS success, this study proposed a model in the context of m-CRM to explore the relationships between m-CRM characteristics (information quality, system quality, and service quality) and personal performance of employees through the full mediating effects of user satisfaction and system use. The results can be summarized as follows.

The best model from this study indicated that m-CRM quality (system quality, information quality, and service quality) and personal performance were fully mediated by system use and user satisfaction. This is in line with the previous findings reporting the mediating effect of system use and user satisfaction (e.g. Delone and Mclean, 2003). In terms of m-CRM information quality, the mediating effects of user satisfaction and system use suggested that customer segmentation and customer information integration may be associated with better personal performance by promoting one's satisfaction and frequency of system use. Regarding m-CRM system quality, system extensibility, a major system characteristic, had no indirect effect on personal performance via user satisfaction and system use. The reason may be that most of m-CRM systems consider seamless connection with Service as a Service (SaaS) applications, the ubiquity of SaaS applications and other internet services and the standardization of their API technology has spawned development of mashups, which are lightweight applications that combine database, modules and functionality from multiple services, creating a compound, and extensible service. For these reasons, e-CRM extensibility may not be enough by itself to impress employees and thereby promote satisfaction, use, and performance. System flexibility had a positive indirect effect on personal performance via system use and user satisfaction. This finding means that

Table VIII. Result of multigroup analysis

Constructs	Number of cases	Mean	SD
All respondents	217	2.11	0.483
Subgroup1 (longer m-CRM use period)	113	2.92	0.432
Subgroup2 (shorter m-CRM use period)	104	1.85	0.419

easier access to information on employees as well as the better integration of CRM with other channels will improve user satisfaction and system use, which in turn affect personal performance. As to m-CRM service quality, immediacy and personalization had significant indirect effects on personal performance via user satisfaction and system use, providing support for *H5* and *H6*, respectively. The mediation effects of system use and satisfaction indicated that immediacy and personalization increase satisfaction and system use, which, in turn, increase personal performance. All these results suggested that employees are concerned with user satisfaction and system use, even though service quality is emphasized. Therefore, we should also maintain user satisfaction, system use rather than only emphasizing service quality.

The results for the moderating effects of the period of m-CRM use confirmed that the period of m-CRM use positively moderates most relationships in our research model while it does not significantly moderate the relationship between system extensibility and personal performance.

6.2 Implications

This study empirically analyzes the effects of m-CRM information, system, and service characteristics on personal performance through the full mediating effects of user satisfaction and system use and evaluates the moderating effects of the period of m-CRM use on their relationships. The results have some important theoretical and practical implications.

6.2.1 Theoretical implications. This study extends CRM research by developing a new research model for investigating the relationships between m-CRM information, system, and service characteristics and employees' personal performance through the full mediating effects of user satisfaction and system use based on DeLone and Mclean's (2003) framework. The results have the following major theoretical implications.

First, many conceptual or empirical studies of CRM have focussed only on those factors influencing CRM adoption and success at the enterprise level. That is, few have provided systematic analyses of individual performance, particularly in the context of mobile environments. Given the emergence of m-CRM as an attractive topic for firms as a result of increasingly severe competition, this study's research model provides a solid theoretical foundation for further m-CRM research on m-CRM characteristics and employees' performance.

Second, most CRM studies have focussed mainly on offline channels and e-CRM, and even some recent studies of m-CRM have generally considered mobile devices as simple, separated tools. However, the present study combines information (particularly customer-oriented information), systems, and services, which closely reflect the unique characteristics of m-CRM, and incorporates them into the proposed model for a systematic analysis of m-CRM characteristics, providing a good theoretical foundation for a deeper and wider understanding of m-CRM.

Third, the study empirically analyzes and verifies causal relationships between m-CRM characteristics and personal performance through the full mediating effects of user satisfaction and system use by adopting DeLone and Mclean's (2003) model of IS success in the m-CRM context. Here the study contributes to the literature by verifying their framework in the context of m-CRM.

Fourth, the study evaluates the moderating effects of the period of m-CRM use on indirect relationships between m-CRM quality and personal performance. The empirical results reveal a moderating effect on the relationship between m-CRM quality and personal performance, providing important theoretical implications for future research on these moderating effects.

6.2.2 Practical implications. For managers or executives who want to improve employees' personal performance through m-CRM, The study provides a number of strategies that they might deploy.

First of all, several determinants of user satisfaction, system use, and personal performance received strong support across empirical studies which deserve special managerial attention. Some of these determinants are within the control of managers or executives. Others may be partially outside of the control of them, such as immediacy and personalization, but managers may still be able to facilitate the some of them across some external measures. For example, they can adopt some related assistive tools to address the requirement of the employees on personalized services. They can also update wireless network infrastructure to get better WIFI coverage.

Second, this model provides a rich portrayal of the dynamics surrounding m-CRM quality measures, satisfaction evaluation, system use, and employees' performance. The results show that employees perceive the benefit of an m-CRM system because they have used it and felt satisfied with information quality, system quality, and service quality, in addition, personal performance should develop if the formation of m-CRM characteristics, user satisfaction and system use is appropriately managed. Practically, management attention might more fruitfully focus on the development of these psychological and behavioral processes. In order to increase employees' personal performance, firms need to develop m-CRM systems with good customer segmentation, customer information integration, system flexibility, immediacy and personalization, which may enhance user satisfaction and system use, and in turn, will influence personal performance.

Third, it is worth noting that only the indirect effect of system flexibility on personal performance was significant. This may be because employees showed more concern about information quality (e.g. customer information integration, customer segmentation) and service quality (e.g. immediacy, personalization) than on system quality. Given that the usage of m-CRM systems is voluntary to a certain extent in most of firms, this study suggest that, in order to attract more employees to use m-CRM systems and make them satisfied with the systems which in turn enhance their personal performance, it is of paramount importance for managers or executives to develop m-CRM systems that provide high-quality information and service including sufficient customer-based analysis, up-to-date customer information, barrier-free design and personalized service.

6.3 Limitations and future research

This study has some limitations. First, based on DeLone and McLean's (2003) model of IS success, this study focusses on the information, system, and service quality of m-CRM, and based on a literature review, the study proposes a model with six factors in three groups. In this regard, future research should consider a wider range of factors. Second, the results reveal significant moderating effects of the period of m-CRM use on various causal relationships. Therefore, future research should consider other factors such as the level of investment and firm size as moderating variables.

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